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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|-----------------------|---------------------|------------------|
| 10/707,984 | 01/29/2004 | David Michael Hoffman | 140804 | 1983 |

7590

06/01/2005

Philmore H. Colburn II
Cantor Colburn LLP
55 Griffin Road South
Bloomfield, CT 06002

EXAMINER

ROSENBERGER, FREDERICK F

ART UNIT

PAPER NUMBER

2878

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

| | | | |
|------------------------------|---|---|--|
| Office Action Summary | Application No. 10/707,984 | Applicant(s) HOFFMAN, DAVID MICHAEL | |
| | Examiner Frederick F. Rosenberger | Art Unit 2878 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>1/29/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 9, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Chappo et al. (US Patent # 6,510,195).

Chappo et al. disclose an ionizing radiation detector comprising:

A first layer **52** (Figure 6) comprising a 1st side and a 2nd side and an array of backlit photodiodes disposed at the 2nd side (bottom of layer **52**);

A second layer **58** (Figure 6) disposed proximate to and opposing the 2nd side of the 1st layer **52**, the 2nd layer comprising thru vias **70** extending from a front side of the 2nd layer to an opposing back side of the 2nd layer;

A scintillator **50** (Figure 6) disposed at the 1st side of the 1st layer **52**, the scintillator comprising a radiation input surface (top of layer **50**) and a radiation output surface (bottom of layer **50**) wherein the scintillation produces light rays exiting at the output surface in response to radiation incident at the input surface, the light rays exiting at the output surface being incident on the 1st side of the 1st layer **52**;

Wherein light rays entering the 1st layer **52** at the 1st side and impinging the backlit photodiodes at the 2nd side result in electrical signals at the thru vias

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70 of the 2nd layer **58**, thereby providing electrical output signals from the backlit photodiodes at a distance from the backlit photodiodes.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-8 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chappo et al., as applied to claims 1 and 13 above.

Chappo et al. disclose all of the limitations of parent claims 1 and 13, as discussed above. However, Chappo et al. are silent with regards to the thickness of the 1st layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the thickness of the 1st layer between 25µm and 150µm, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working range involves only routine skill in the art. In re Aller, 105 USPQ 233.

Chappo et al. further disclose that the 1st layer **52** is bonded to the 2nd layer **58** through bumps **56** comprising a soft metal, lead-tin solder, or conductive epoxy (column 6, lines 59-62). Chappo also discloses that the 1st layer is made from silicon (column 6, lines 8-14). However, with regards to the 2nd layer, Chappo only discloses that the 2nd

layer, as a carrier substrate, carries an electrical circuit for facilitating an electrical signal from the 1st layer and the signal processing electronics (column 6, lines 48-51). There is no specific mention that the 2nd layer comprises silicon. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use silicon for the 2nd layer, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

5. Claims 10 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chappo et al., as applied to claims 1 and 13 above, and further in view of Doubrava et al. (US Patent # 6,512,809).

Chappo et al. disclose all of the limitations of parent claims 1 and 13, as discussed above. Chappo et al. further disclose a 3rd layer in the form of a printed circuit board **92** (Figure 9) having electrical connections **94** on a first board surface for signal communications with the thru vias **70** at underside contacts **57** (column 10, lines 4-7). Chappo et al. have not addressed the location of additional electrical components on the printed circuit board **92**, although backside mounting of an electrical component to the second layer has been illustrated in Figure 6.

Doubrava et al. teach a multilayer radiation detector for X-ray CT systems. Doubrava et al. also teach that the 1st and 2nd layers can be combined with a 3rd layer as a printed circuit board (column 3, lines 14-16). However, Doubrava et al. additionally

teach that additional electronic components can be mounted to the backside of the printed circuit board to enable compact construction (column 3, lines 16-20).

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to modify Chappo et al. to have electrical components mounted on the backside of the 3rd layer printed circuit board to enable compact construction, as taught by Doubrava et al.

6. Claims 11, 12, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chappo et al., as applied to claims 1 and 13 above, and further in view of Luhta et al. (Conference paper entitled "Back Illuminated Photodiodes for Multislice CT").

Chappo et al. disclose all of the limitations of the parent claims 1 and 13, as discussed above. However, Chappo et al. are silent with regards to the cell-to-cell signal crosstalk of the array.

Luhta et al. disclose a design for a multilayer CT detector utilizing a back illuminated photodiode array. To reduce crosstalk in the device, cuts were made between the elements of the array (page 239, section 2.3). The resultant photodiode array exhibited a crosstalk of about 1% (page 240, bottom of section 3.2). As is well known in the art, lower crosstalk between pixels results in greater resolution and image quality.

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to modify Chappo et al. to include a back illuminated

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photodiode layer with slots to achieve a crosstalk of 1%, as taught by Luhta et al., so as to maximize detector resolution and resultant image quality.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Possin et al. (US Patent # 6,707,046) is the US Patent of the patent application publication US 2003/0122083 submitted on applicant's IDS.

Tashiro et al. (US Patent # 6,671,347) disclose a radiation imaging apparatus using a front-lit photodiode as a 1st layer, coupled to a scintillator array, with a second layer providing electrical contact to the 1st layer through vias.


Heismann et al. (US Patent Application Publication 2004/0113086) disclose a X-ray image detector having a scintillator, a backlit photodiode as the 1st layer, a 2nd layer providing electrical contacts to the 1st layer through vias, and a 3rd layer of discrete electronic components.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frederick F. Rosenberger whose telephone number is 571-272-6107. The examiner can normally be reached on Monday-Friday 7:30 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Frederick F. Rosenberger
Patent Examiner
GAU 2878



DAVID PORTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800